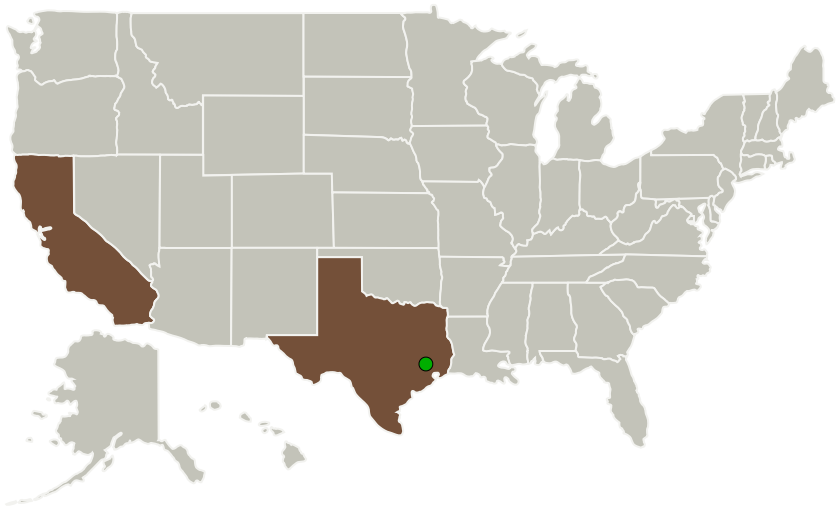
Modified Ionic Liquid-Based Phase Change Materials as Effective Heat Exchangers, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Future manned spacecraft venturing into deep space will require sophisticated thermal control systems to protect against extreme environments ranging from direct illumination by solar radiation to complete darkness. To manage these extremes, heat exchangers composed of phase change materials, which can expand and contract without causing structural damage, will be essential. NASA is seeking non-toxic heat transfer fluids with transition temperatures between 8 and 12 (deg)C with heat of fusion >200 kJ/kg. Specifically, the fluids must have suitable thermal conductivity, high heat capacity, and low viscosity to enable flow with negligible volume expansion. Changes are also needed to reduce the existing heat transfer unit size and weight. InnoSense LLC (ISL) plans to develop new modified ionic liquid-based phase change materials heat exchangers. ISL, in collaboration the University of Nevada, will synthesize salt additives to modulate the operating temperatures, and the thermal and flow properties of the ionic liquid based eutectic phase change material with negligible volume change during phase change. In Phase I, ISL will formulate and test heat transfer formulations in a laboratory environment to demonstrate feasibility. During Phase II, ISL will scale-up synthesis and test fluid performance in a larger experimental apparatus and a wide range of working environments.

Primary U.S. Work Locations and Key Partners



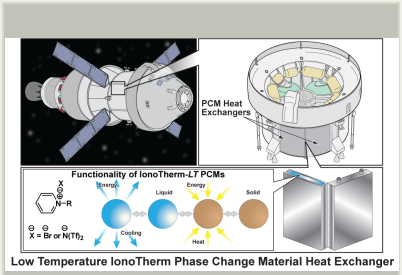


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Innosense, LLC	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB), Women-Owned Small Business (WOSB)	Torrance, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

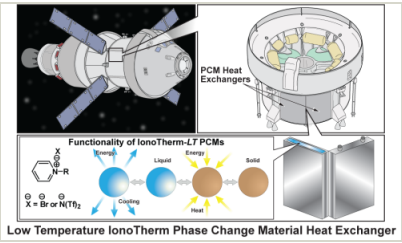
June 2016: Project Start

December 2016: Closed out

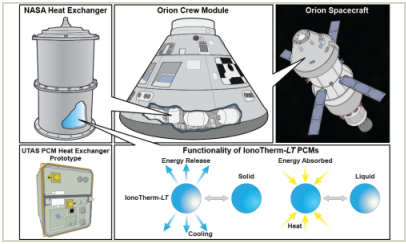
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140274)*

Images



Briefing Chart Image
Modified Ionic Liquid-Based Phase Change Materials as Effective Heat Exchangers, Phase I *(https://techport.nasa.gov/image/132505)*



Final Summary Chart Image
Modified Ionic Liquid-Based Phase Change Materials as Effective Heat Exchangers, Phase I Project Image *(https://techport.nasa.gov/image/130673)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Innosense, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

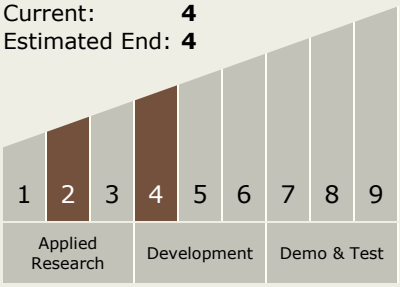
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Kevin Yu

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Modified Ionic Liquid-Based Phase Change Materials as Effective Heat Exchangers, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System